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(54) ## IRRADIATION APPARATUS

HOLZ/

G3935W/25 *CA -968-854

Irradiation appts for thermotherapy - has control cct. to produce serial light pulses travelling along lamp bank

HOLZER J 25.11.69-CH-017603

*P34 (03.06.75) A61n-00/.**

The irradiation device for thermotherapy has at least one series of light sources which are arranged one next to the other and intended to be placed over a portion of the human body. A control circuit means serves to switch-in the light sources of the series one after the other and during a predetermined time in order to generate a light wave which moves from one end to the other end of the series of light sources. Additionally, means are provided in order to again switch-in the first light source and to trigger a new operation cycle as soon as the last light source of the series of light sources has extinguished. 24.11.70 as 098940. (29pp)

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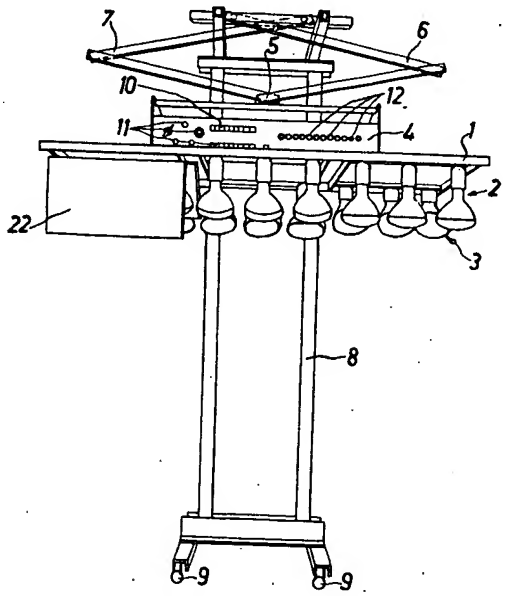

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BACKGROUND OF THE INVENTION

The present invention relates to an irradiation apparatus for therapeutic purposes, especially thermotherapy.

Therapeutic treatments are known which rely upon radiating the human body with heat and light. Many of the apparatuses which have been constructed for this purpose, the energy is radiated by incandescent bodies, especially lamps, this energy being distributed over a wide band of waves which extend from visible light up to the infrared radiation. Through the use of suitable filters, it is possible to particularly accentuate special wave regions.

In order to ensure that an intensive hyperemia prevails at the radiated portions of the body, a patient is generally subjected to radiation for a period of about 5 to 20 minutes.

Since the energy absorbed by the body is dependent upon the angle of incidence of the energy flow and since the radiated surface is not necessarily flat or planar, locations automatically appear which are locally more intensively heated than others. The intensity of the radiation, transmitted by the radiation source, is thus limited at the upper range by that temperature which that location of the body is subjected to which absorbs the greatest

dose of energy.

Another important therapeutic treatment is the massage, and specifically that type of massage in which the massaging hand is moved lightly over the body in order to transmit heat from the hand of the masseur into the skin of the patient. A masseur with a good blood circulation in his hands has greater success in carrying-out his treatment than one with cold hands. When the massaging hand moves over the body of the patient, there exists an excitation or stimulation by virtue of the thermal waves, this wave moving along with the massaging hand.

SUMMARY OF THE INVENTION

Accordingly, it is a primary objective of the present invention to provide an irradiation apparatus suitable for therapeutic purposes, and particularly for carrying-out thermotherapy.

Another and still more specific object of the present invention relates to the provision of a new and improved irradiation apparatus by means of which it is possible to produce the effect of a thermal wave which was obtained previously by a massaging hand when carrying-out the above-mentioned massaging operation.

Still a further significant object of the present invention relates to an improved therapeutic apparatus, particularly a radiation apparatus for thermotherapy wherein a thermal wave can be successively propagated along a defined area of the body to be treated in a selective and controlled manner.

Now, in order to implement these and still further objects of the invention, which will become more readily apparent as the description proceeds, the apparatus of the invention is generally manifested by the features that it embodies at least one series of light sources arranged behind one another which are intended to be placed in the neighborhood of a portion or location of the body which is to be radiated. The invention additionally contemplates a control circuit means for switching-in in succession the light sources of the aforementioned series one after the other and during a predetermined time, in order to produce a source of light which moves or propagates from one end to the other of the aforementioned series of light sources. Further, means are provided for again switching-in the first light source and therefore initiating a new cycle as soon as the last light source of the series has been switched-off.

Hence, the irradiation or radiation apparatus of the present invention allows generating a light wave, that is to say, a thermal wave, which moves in a predetermined direction with an

adjustable speed or velocity. Each traverse or passage of the thermal wave, which contacts the human body, repeats itself in an adjustable time rhythm or cycle. During the rest period or interval between two successive passages of the thermal wave there occurs an equalization or balancing out of the temperature between those locations of the body which locally have absorbed more or less energy. Therefore, it is possible to utilize an intensified, maximum radiation capacity or power than when proceeding with conventional irradiation apparatus. Additionally, with the equipment of this invention, there is attained the desired effect corresponding to that of the thermal waves which appear when a massaging hand is lightly moved over the body. The triggering of the thermal and light waves can be controlled by an external signal. It is therefore possible, of course by utilizing a suitable mechanism, to synchronize the rhythm of the triggering of the thermal waves with a selectible fraction of the frequency of a biorhythmic phenomena, such as for instance with the pulse beat.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will be better understood and objects other than those set forth above, will become apparent when consideration is given to the following detailed description thereof. Such description makes reference to the annexed drawings wherein:

FIGURE 1 is a perspective view of a first embodiment of irradiation apparatus incorporating two rows of lamps supported by a frame unit, the apparatus shown in that figure being intended to undertake a thermal massage in one direction at the body of a human being;

FIGURE 2 is a front view as viewed from the bottom of a portion of the irradiation apparatus depicted in Figure 1;

FIGURE 3 is a perspective view of a second embodiment of irradiation apparatus which incorporates three surfaces which have been hingedly connected to one another, these surfaces can be placed about a portion of the human body, and wherein a number of series of lamps are arranged at each of the three surfaces or the three components forming such surfaces;

FIGURE 4 schematically illustrates an arrangement of a series of lamps for an irradiation apparatus which is intended to perform a circular thermal massage;

FIGURE 5 is again a schematic representation of still a further arrangement of a series of lamps which are intended to be used with a modified version of irradiation apparatus and disposed along a spiral;

FIGURE 6 is a block circuit diagram of the electronic circuitry utilized for controlling the different lamps of any one of the irradiation apparatuses proposed according to the inventive teachings; and

FIGURE 7 is a variant form of the upper portion of the electronic control circuitry depicted in Figure 6.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Describing now the drawings, the exemplary embodiment of therapeutic apparatus depicted in Figures 1 and 2, specifically the irradiation apparatus thereof will be seen to comprise a frame unit 1 which supports two rows 2 and 3 of lamps, wherein in the depicted arrangement nine lamps are provided for each row. Above the frame unit 1 there is arranged a housing or casing 4 serving to accommodate the electronic circuitry for controlling the lamps, such as the circuitry of Figure 6 or Figure 7, and specifically a circuit arrangement which ensures that the lamps of both rows 2 and 3 will be switched-in one after the other or in succession in order to form a thermal wave which propagates from one to the other end of the frame unit 1. The just-mentioned electronic control circuitry will be considered in greater detail in conjunction with the description of Figures 6 and 7.

Continuing, it is to be observed that the housing or casing 4 is secured by means of a hinge joint 5 at two arm members 6 and 7. The arm members 6 and 7 are arranged at a stand or upright 8 in such a manner that the frame unit 1 can be lowered over a certain location of the body of a patient or person to be treated who, for instance, is lying down upon a support surface such as a bed. In order to preserve clarity in illustration the bed has been omitted from the representation of the drawing. The upright or support 8 is mounted conveniently upon casters or rollers 9 so that it can be easily brought over to the bed or support surface upon which there is resting the patient or person to be treated. At the visible portion of the housing 4, there are certain control lamps 10 as well as a number of control- and regulating knobs or buttons 11 and 12, the function of which will be rendered apparent during the explanation of the electronic circuitry of Figure 6.

In the illustration of Figure 2, it can be ascertained that the frame unit 1 consists of two outwardly or external rod members 13 of a slight thickness and the transverse supports or rods 15, 16, 17, etc., which are secured to the rods 13, as shown. Between each two transverse rods or supports, for instance between the rods or supports 15 and 16, there is a bar or rod 18 mounted to be displaceable in the transverse direction and pivotable about its own lengthwise axis. Upon each of the rods

18, there are arranged three lamps 19, 20 and 21 which, depending upon the type of thermal massage or depending upon the surface of the human body which is to be radiated, can be adjusted as to their direction of operation. Hence, the arrangement of apparatus structure depicted in Figures 1 and 2 therefore consists of six groups of lamps, each group consisting of three lamps which are arranged independently of one another. Accordingly, it will be observed that the spacing between the respective axis of both series of light sources is fixed and that the direction of radiation of one series of light sources can be disposed at a fixed angle with respect to the direction of radiation of the other series of light sources so that a body can be radiated from both sides. For each group of three lamps, there is additionally provided a reflector mechanism 22 which, likewise, is secured to the rod or bar 18 carrying the corresponding group of lamps. Each reflector 22 is provided with schematically illustrated elongate slots 22a at the lower ends 23 and 24 thereof in order to receive a suitable filter, for instance such as an infrared filter.

The modified version of treatment apparatus depicted in Figure 3 will be seen to embody the plate members 25, 26 and 27 which are hingedly connected to one another by means of the hinge or pivot joints 28 and 29. Furthermore, each plate member 25, 26 and 27 is equipped with a number of rows 30, 31, 32, 33, etc. of lamps 40. The lamps of one row, for instance the row 30, are

connected for example in series and the successive switching-in of each corresponding row of the three components 25, 26 and 27 is controlled by the same electronic control circuit, for example by the control circuit to be described in conjunction with Figure 6. The rear face of each plate member or component 25, 26 and 27, that is to say the face or side where the electrical connections are located, is covered with a corresponding sheet metal member 41, 42 and 43, respectively. Further, the central region of the intermediate sheet metal plate 42 is secured via a hinge joint at an arm member 44, which, in turn, can be arranged upon a non-illustrated carriage. This carriage or trolley also houses the electronic control circuitry. Moreover, the apparatus could be secured by means of a suitable clamping mechanism to a table or to a bed. The exact arrangement for securing or fastening such irradiation apparatus as shown in Figure 3 is unimportant to the actual concepts of the invention, and therefore, has not been illustrated in any greater detail. Suitable attachment devices for the purpose of securing the apparatus to a desired support will suggest themselves to those versed in the art and are available or capable of easily being constructed.

Just as was the case with the apparatus structure of Figures 1 and 2, the lamps of the treatment apparatus of Figure 3 are also provided with small reflectors 45, 46, 47, etc. By virtue of these three components or plate members 25, 26, 27 which

are hingedly connected to one another by any suitable pivot or hinge joint the apparatus structure under consideration is therefore especially suitable for the radiation of curved surface portions of the human body, for instance the radiation of one side of the upper region of the body. By appropriately positioning or arranging the three plate members 25, 26 and 27, it will be apparent that any desired portion of the human body, which is to be treated, can be surrounded or enclosed.

The lamps of the embodiments of Figures 1, 2 and 3 are incandescent or glow lamps. Yet, it should be readily understood that these lamps can be replaced by a different type of lamp, and therefore, the lamps depicted in Figures 1, 2 and 3 can for instance be conceptionally considered to also be ultraviolet lamps or infrared lamps. On the other hand, with the embodiment depicted in Figures 1 and 2, the lamps possessing the same arrangement of both rows, that is to say, both respective lamps of Figure 1 which are arranged behind one another are simultaneously switched-in, it is apparent that each group of two lamps can also be replaced by a tube which extends over the entire length of the frame 1. The same observations can also be made with regard to the arrangement of Figure 3 where all lamps of the rows 30, 31, 32, etc. which are connected in series, can be likewise replaced by tubes which extend from one end to the other end of the plate members 25, 26 and 27. In such

an arrangement, there would thus be present three series of nine tubes, all of which are parallel to one another.

Figures 4 and 5 illustrate schematic representations of further arrangements of the lamps 50 and 51, respectively, which are provided at schematically illustrated supports or holders 50a and 51a respectively used to carry-out thermal massages at one point of the human body. Switching-in of the lamps 50 or 51 likewise occurs by means of the control circuitry illustrated in Figure 6, that is to say, the lamps are switched-in one after the other, and specifically during a predetermined time, so that the thermal wave rotates at the corresponding support or holder 50a and 51a respectively, along a circle (Figure 4) or along a spiral (Figure 5). The center of such spiral is located approximately at the center of the associated headpiece or support 51a.

Having now had the benefit of the description of the various embodiments of irradiation apparatus depicted in Figures 1 to 5, inclusive, attention is now invited to Figure 6 where there is illustrated the control circuitry which is used in conjunction with the heretofore mentioned apparatus constructions of Figures 1 to 5, inclusive. More specifically, the electronic control circuitry of Figure 6 is utilized for switching-in the lamps or lamp series in succession, that is to say, for the purpose of applying a voltage to such lamps or series of lamps.

Turning now to Figure 6, in particular, the illustrated control circuitry thereof will be seen to embody three main components 52, 97 and 58. The circuit component 52 serves to switch-in in succession the lamps as well as regulating the time span during which these lamps are under voltage, that is to say, should be switched-in. The circuit component 52 is supplied by a voltage doubler-rectifier arrangement 53 which, in turn, is coupled electrically to the supply terminals 54 and 55 (220 volt supply for instance) through the agency of the conductors 56 and 57. On the other hand, the terminals 54 and 55 are electrically coupled via both conductors 59 and 60 with a supply circuit 58 for the lamps.

In particular, between these conductors 59 and 60 there are coupled the nine or nine series of lamps 61 to 69, and a triac 70, 71, 72,...78, respectively, is connected in series with each such lamp 61, 62, 63...69. Each triac 70, 71, 72,...78 is controlled by a diac 70a, 71a, 72a,...78a, respectively, which, in turn, is connected via a respective capacitor 79, 80, 81, 82... 87 with the conductor 60 and via a resistor 88a, 89a, 90a...96a with a respective switch 88, 89, 90,...96. The switches 88 to 96 are arranged at the output side of a reversing circuit 97 and permit, the control signals arriving via such circuit 97 from the control circuit portion 52,to interrupt the lamps 61 to 69, that is, they permit switching-off that lamp or lamps whose corres-

ponding switch is open.

As already mentioned heretofore, the switching or control circuit component 52 embodies a voltage doubler-rectification arrangement 53 supplied with power via the conductors 56 and 57. This rectifier arrangement or circuit 53 encompasses two diodes 98, two capacitors 99 and 100 and a resistor 101, the diodes 98 and the capacitor 99 being coupled parallel to both output lines or conductors 102 and 103 of the rectifier arrangement 53. A third diode, namely a Zener diode 98a is connected to the output side of the rectifier circuit parallel to the capacitor 99, this Zener diode serving to stabilize the voltage delivered by the voltage-doubler rectifier arrangement. Additionally, across the output conductors 102 and 103 there are parallelly connected a push-button contact switch 104 and a resistor 105 as well as two relay tubes with cold cathodes 106 and 107. A resistor 108 and 109 is coupled with the anodes 110 and 111 of the relay tubes 106 and 107, respectively. The anode 110 of the tube 106 is connected parallel to the anodes 112 to 116 of the further relay tubes 117 to 121, while the anode 111 of the tube 107 is connected parallel to the anodes 122 to 126 of the relay tubes 127 to 131. The cathodes 132 to 143 of the relay tubes 106, 107, 117, 127, 118, 128, 119,129, 120, 130, 121 and 131 are each coupled with parallelly connected circuit components consisting of a respective resistor 144, 145, 146...155 and a parallelly connected

capacitor 156, 157, 158...167, respectively, such parallel connected circuit components being, in turn, electrically coupled with the conductor 103, as shown. On the other hand, the cathodes 132 to 142 of each of the relay tubes 106, 107, 117, 127, 118,128, 119, 129, 120, 130 and 121 are connected with an electrode 168, 169, 170, 171...178 of the next successive relay tube i.e., the next tube arranged at the right in the circuit arrangement of Figure 6, and specifically, such connection is via a potentiometer 179, 180, 181, 182...190, respectively. Furthermore, the cathode 143 of the last relay tube 131 is connected by means of a switch 191, a conductor 192 and a potentiometer 193 with an electrode 194 of the first relay tube 106.

The previously mentioned relay tube 106 possesses a second electrode 195 which is connected via a resistor 196 between the push button-contact switch 104 and the resistor 105. A respective capacitor 197, 198,...207 is connected in series with the corresponding electrodes 194 and 168, 169...177 and the cathodes 132, 133, 134...142 of each tube 106, 107, 117, 127, 118, 128, 119, 129, 120, 130 and 121. Finally, the cathodes 132 to 140 of the tubes 106, 107, 117, 127, 118, 128, 119, 129, and 120 are connected via reversing switches 208 to 215, respectively, and wiring 216 with the switches 88 to 96. The reversing switches 208 to 215, the wiring 216 and the switches 88 to 96 constitute a portion of the reversing circuit 97. Furthermore, it should be

readily apparent that with the position of the reversing switches 208 to 215 as shown in Figure 6, the tube 106 initially switches-in the lamp 61 and specifically through the agency of the diac 70a and the triac 70, and thereafter the tube 107 will switch-in the lamp 62, and specifically via the diac 71a and the triac 71, and so forth. Hence, the lamps 61, 62, 63, 64, etc. are switched-in and switched-out from the left to the right of the circuit arrangement of Figure 6.

However, if the reversing switches 208 to 215, the control of which has been schematically illustrated in Figure 6 and particularly via a rod 217, are switched so as to assume the phantom line position, then it will be equally apparent that the tube 106 will now control the lamp 69, the tube 107 the lamp 68, and so forth. Consequently, the switching-in of the lamps will now occur from the right towards the left of the circuitry of Figure 6. In view of the explanation given above, and the discussion to follow, no further explanation will be given regarding the mode of operation of the reversing circuit 97, and it will be assumed in the following discussion that the reversing switches 208 to 215 are located in the position shown in full lines in Figure 6.

It is assumed that the terminals 54 and 55 are coupled

with the power network and that the switching circuit arrangement of Figure 6 is supplied with voltage. The voltage doubler-rectifier circuit arrangement 53 applies a positive voltage to the anodes 110, 111, 112, 122, 113, 123, 114, 124, 115, 125, 116, and 126 of the relay tubes equipped with cold cathode tubes 106, 107, 117, 127, 118, 128, 119, 129, 120, 130, 121, and 131, respectively, which at the moment do not pass any current. In order to trigger the switching operation the push button-contact switch 104 is depressed so that a positive voltage is applied to the electrode 195 of the tube 106. Electrode 195 cuts-in the tube 106 which then becomes conductive and the voltage at the cathode 132 of the tube 106 becomes positive. This positive voltage, in turn, switches-in the diac 70a via the resistor 88a, causing the triac 70 to become conductive and the lamp or series of lamps 61 are switched-on. The triac 70 remains conductive for such length of time as the positive voltage is maintained at the cathode 132 of the tube 106. However, as soon as the tube 106 becomes conductive, the positive voltage appearing at the cathode 132 of the tube 106 begins to charge up the capacitor 198 of the next following tube 107 via the potentiometer 179, and the electrode 168 of the tube 107 becomes positive. This tube 107 then becomes conductive and a positive voltage appears at the cathode 133 of such tube 107. Once again, this positive voltage is delivered to the resistor 89a, switching the triac 71 by means of the associated diac 71a, and the next lamp 62 is turned-on. On the other hand, the positive voltage appearing at the

cathode 133 of the tube 107 charges up the capacitor 199 of the next successive tube 117 via the potentiometer 180, and the electrode 169 of the next successive tube 117 becomes positive. At the moment where the tube 117 begins to conduct there appears across the terminals of the resistor 108 a voltage drop which is added to the voltage drop which is present because of the already existing power supply to the tube 106. The voltage which now appears between the anode 110 and the cathode 132 of the first relay tube 106, is no longer sufficient to supply the just-mentioned tube and such extinguishes or cuts-off. Now, the positive voltage at the cathode of the tube 106 disappears, the triac 70 is turned-off and the lamp 61 extinguishes. When the tube 117 begins to ignite or conduct, the voltage at the cathode 134 of this tube becomes positive and the lamp 63 is switched-in, and specifically via the triac 72 which has been switched-on by means of the associated diac 72a. The capacitor 200 charges and the electrode 170 of the tube 127 likewise becomes positive. The tube 127 begins to conduct, which in turn causes an additional voltage drop at the resistor 109 and the tube 107, causing the tube 107 to cut-off. The diac 71a which is no longer furnished with power interrupts the action of the triac 71 and now the lamp 62 extinguishes. As should be apparent from the foregoing discussion, this operation repeats and the lamps 63, 64, 65, and so forth are successively switched-in and again switched-out and the light wave travels from the left towards the right, whereby

in each instance, no more than two tubes and accordingly no more than two associated lamps are ignited or turned-on at one time. The three additional tubes 130, 121 and 131, the cathodes 141, 142 and 143, respectively, of which are not coupled with any lamps, are important because it is necessary to turn off both of the tubes 129 and 120, which control the last two lamps 68 and 69, respectively, and because the first tube 106 must again be turned-on in order that the radiation process can automatically begin anew. To this end, the switch 191 is closed and as soon as the last tube 131 becomes conductive, its cathode 143 charges the capacitor 197 which is connected parallel to the electrode 194 and the cathode 132 of the first tube 106, and specifically by means of the conductor 192 and the potentiometer 193. The electrode 194 becomes positive, the tube begins to conduct and the entire operation begins once again.

The potentiometers 193 and 179 to 190 enable adjusting the charging time of the capacitors 197 to 207, respectively, in other words, that time span after which the corresponding next successive tube should be turned-on. By adjusting such potentiometers, it is possible to select the propagation velocity of the light wave. Furthermore, since these potentiometers are independent of one another, it is also possible to regulate all desired combinations, in other words, for instance a high propagation velocity of the light wave for the first four lamps,

then followed for instance by a slowing down of this propagation velocity for the following lamps, and so forth. The potentiometer 193 serves to regulate the rest period or interpause between two successive waves. Therefore, it permits charging-up the capacitor 197 which applies voltage to the electrode 194 of the first tube 106. The charging time of this capacitor therefore defines the time-constant which determines the interpause between two successive waves. The potentiometers 179, 190 and 193 are indicated at the housing 4 of the embodiment of Figures 1 and by the reference character 12.

The switches 88 to 96 arranged at the output side of the reversing circuit arrangement 95 of Figure 6 enable switching-out one or more of the lamps, which then during operation of the apparatus remain inoperable. These switches have been indicated in the embodiment of Figure 1 by the reference character 10.

With the variant embodiment of circuitry shown in Figure 7, the voltage doubler-rectification circuit arrangement 53A is connected via the three resistors 226, 227 and 228 with the anodes 220, 221 and 222 of the tubes 223, 224 and 225, respectively. The tubes 229, 230 and 231 are connected in parallel with the anode of the tube 223, and the tubes 231', 232 and 233 and also tubes 234, 235 and 236 are connected with the anode 221 of the tube 224 and the anode 222 of the tube 225, respectively.

The resistance values of the resistors 226, 227 and 228 are chosen in such a way that at most three tubes are simultaneously supplied with power. It is therefore apparent that with the circuit arrangement of Figure 7, three tubes are always turned-on so that the region radiated by the light wave, which wave for instance moves or propagates from the left towards the right, is greater than that generated with the circuitry of Figure 6, by means of which, it will be recalled, in each case only two lamps were simultaneously turned-on.

Naturally, it is readily possible to always switch-in at any one time only one lamp or a series of lamps. In such case, it is sufficient if the resistors 227 and 228 of the circuitry of Figure 7 are omitted and all of the anodes of the tubes 223 to 225, 229 to 233 and 236 are connected by means of a single conductor or line. In such case, the lamps will be switched-in one after the other in succession, so that due to the switching-in of a lamp a voltage drop will appear at the terminals of the resistor 226 which will cut-off the preceding lamp. Further, it will be observed that two terminals 237 and 238 are provided in parallel to the push button-contact switch 104A. By means of these terminals 237, 238, it is possible to connect a device or instrument 239 which, for instance, responds to the pulse beat of a patient. This device 239 is provided for the purpose of delivering a signal by means of which the electrode 240 should be charged in order to ignite the tube 223 and to trigger the

irradiation or radiation operation each time when a multiple of the pulse frequency of the patient has been reached.

For instance, the device 239 is designed to count six pulse beats and after each sixth pulse beat, once again triggers the radiation process. Of course, when using this device 239, the switch 191A must be open so that the tube 236 does not automatically cut-in the first tube 226 through the agency of the feedback line or conductor 192A.

Naturally, the device 239 could measure some other parameter than the pulse beat of the patient, such as for instance a different physiological rhythmic function of the human body, for instance the breathing cycle or rhythm, the pulse beats at the extremities of the body, or it could also respond to bio-electric currents in conjunction with the rhythmic heart activity, and so forth.

While there is shown and described present preferred embodiments of the invention, it is to be distinctly understood that the invention is not limited thereto but may be otherwise variously embodied and practiced within the scope of the following claims. ACCORDINGLY.

THE EMBODIMENTS OF THE INVENTION IN WHICH AN EXCLUSIVE PROPERTY OR PRIVILEGE IS CLAIMED ARE DEFINED AS FOLLOWS:

1. An irradiation apparatus for thermotherapy, comprising one set of electric light sources or a plurality of such sets, each having an equal plurality of light sources, forming a plurality of lighting units arranged next to one another between a first unit and a last unit of said plurality of units, each lighting unit consisting of a respective light source from said one set or a respective light source from each of said plurality of sets of light sources the light sources being mounted for placing selectively over a portion of a human body to be treated, a control circuit electrically coupled with said light sources in order to switch on the lighting units one lighting unit after another or to switch on groups of lighting units one group after another each for a predetermined period of time in order to generate a light wave which travels in one operating cycle from the first to the last lighting unit or inversely, and said control circuit incorporating means for triggering a new operating cycle after one operating cycle has ended.

2. The apparatus as defined in claim 1, further including a frame for carrying said light sources, a support for said frame, means connecting said frame to said support for permitting said frame to be placed in a predetermined position with respect to a portion of the body to be radiated.

3. The apparatus as defined in claim 2, wherein said frame is equipped with two sets of light sources, the light sources of one set being mounted on one side of an axis of the frame and the light sources of the other set on the other side of the axis, the pairs of light sources forming said lighting units being arranged next to one another along said axis.

4. The apparatus as defined in claim 3, further including means for adjustably positioning the light sources of each set transverse to said axis of the frame.

5. The apparatus as defined in claim 3, wherein the direction of radiation of one set of light sources forms a fixed angle with respect to the direction of radiation of the other set of light sources for allowing a

15. The apparatus as defined in claim 14, wherein said switched-on of the first or last lighting unit at the end of each operating cycle is controlled by the last relay tube of the aforementioned plurality of relay tubes, there being an adjustable element for preselecting the time-interval between two successive cycles.

16. The apparatus as defined in claim 14, wherein said switching-on of the first or the last lighting unit at the end of each operating cycle is effected by a device responsive to a physiological periodic function of the human body, said device delivering a pulse which again switches-on the relay tube associated with the first or the last lighting unit after the expiration of a predetermined multiple of the period of said function.

17. The apparatus as defined in claim 14, wherein said relays for controlling said light sources are triacs.

18. The apparatus as defined in claim 14, wherein said control circuit further includes reversing circuitry between said relay tubes and said lighting units in order to reverse the sequence of operation of switching-on of the lighting units.

19. The apparatus as defined in claim 14, further including means for adjusting the time-interval during which each lighting unit is switched on.

20. The apparatus as defined in claim 19, wherein said adjusting means provide for the relay tubes acting in a three by three succession, in order to generate a light wave which travels in successive steps of each three successive lighting units, from a first group of three lighting units including said first lighting unit to a last group of three lighting units including said last lighting unit, or inversely.

21. The apparatus as defined in claim 14, further including switches between said relay tubes and said relays which control switching-on of the lighting units and which switches serve for selectively switching-out one or more lighting units.

body to be radiated from two sides.

6. The apparatus as defined in claim 2, wherein said frame comprises three components pivotably mounted one to another, said three components being positionable at an optional orientation with respect to one another, each of said three components carrying at least one set of light sources.

7. The apparatus as defined in claim 2, wherein said frame supports one set of light sources arranged along a circle.

8. The apparatus as defined in claim 2, wherein said frame supports one set of light sources arranged along a spiral.

9. The apparatus as defined in claim 1, further including a reflector for each light source.

10. The apparatus as defined in claim 9, wherein each reflector includes mechanism for attaching a filter thereto.

11. The apparatus as defined in claim 1, wherein said light sources radiate radiation in the visible spectrum.

12. The apparatus as defined in claim 1, wherein said light sources radiate infrared radiation.

13. The apparatus as defined in claim 1, wherein said light sources radiate ultraviolet radiation.

14. The apparatus as defined in claim 1, wherein said control circuit incorporates a plurality of relay tubes in a number equal to the number of light sources in a set and connected to act in succession from a first relay tube to a last relay tube, each relay tube controlling the light source or sources of a respective lighting unit via a respective associated relay, said plurality of relay tubes being for switching-on, via the associated relays, the lighting units in succession and again switching-out each such lighting unit after a predetermined period of time.

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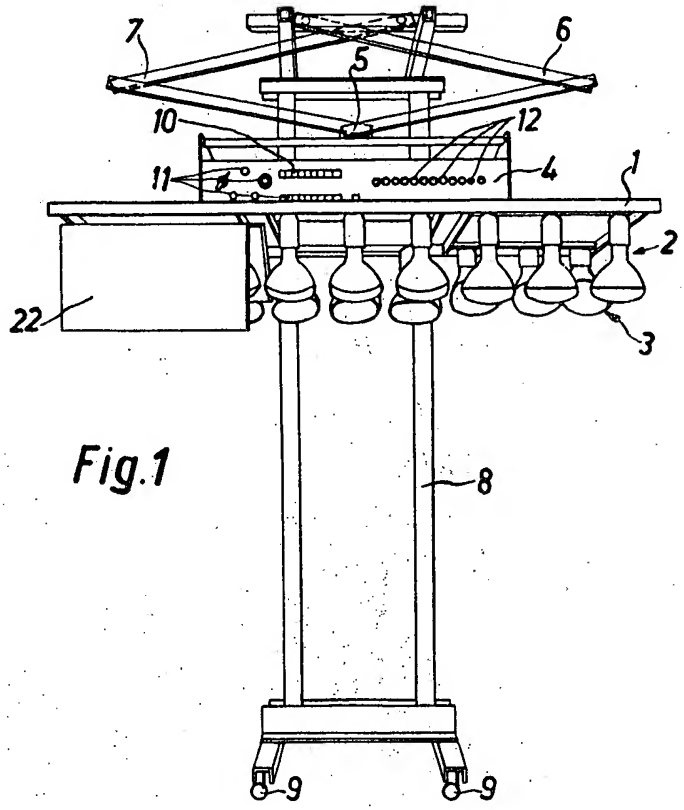


Fig.1

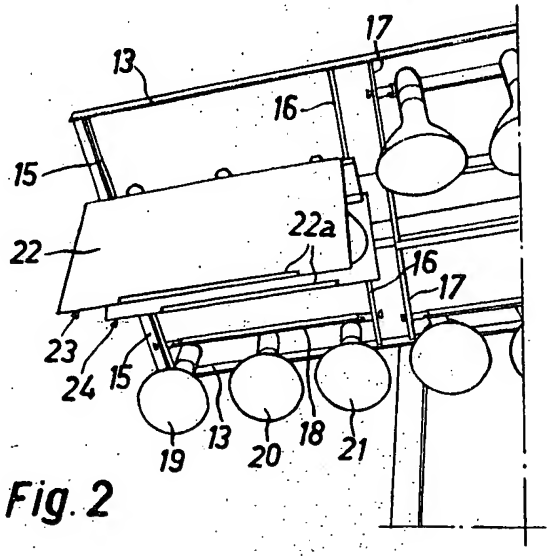


Fig. 2

Fig.3

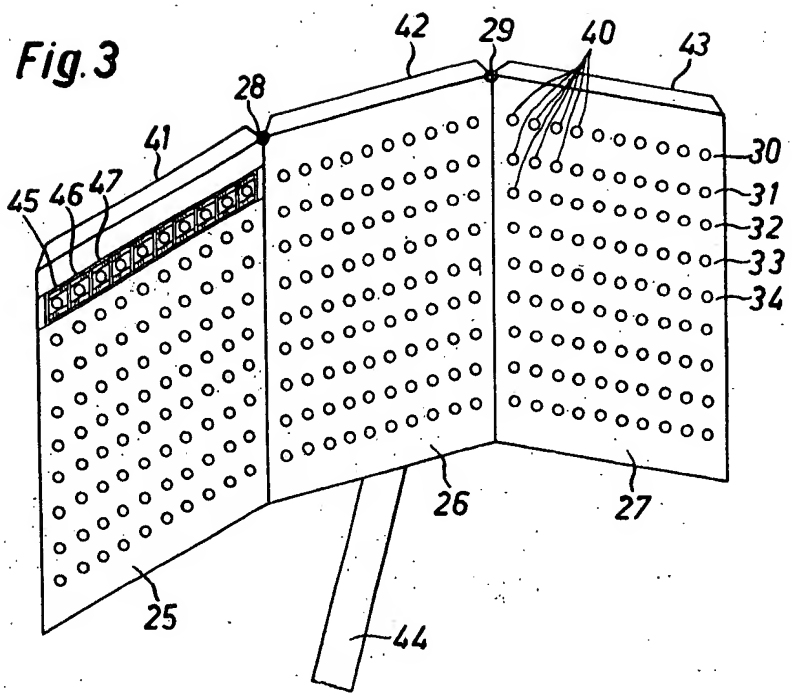


Fig.4

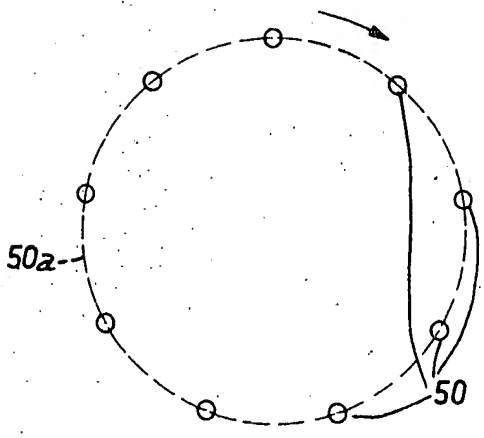
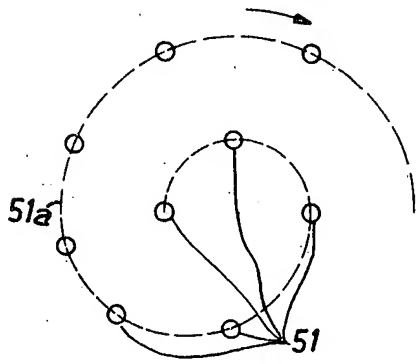


Fig.5



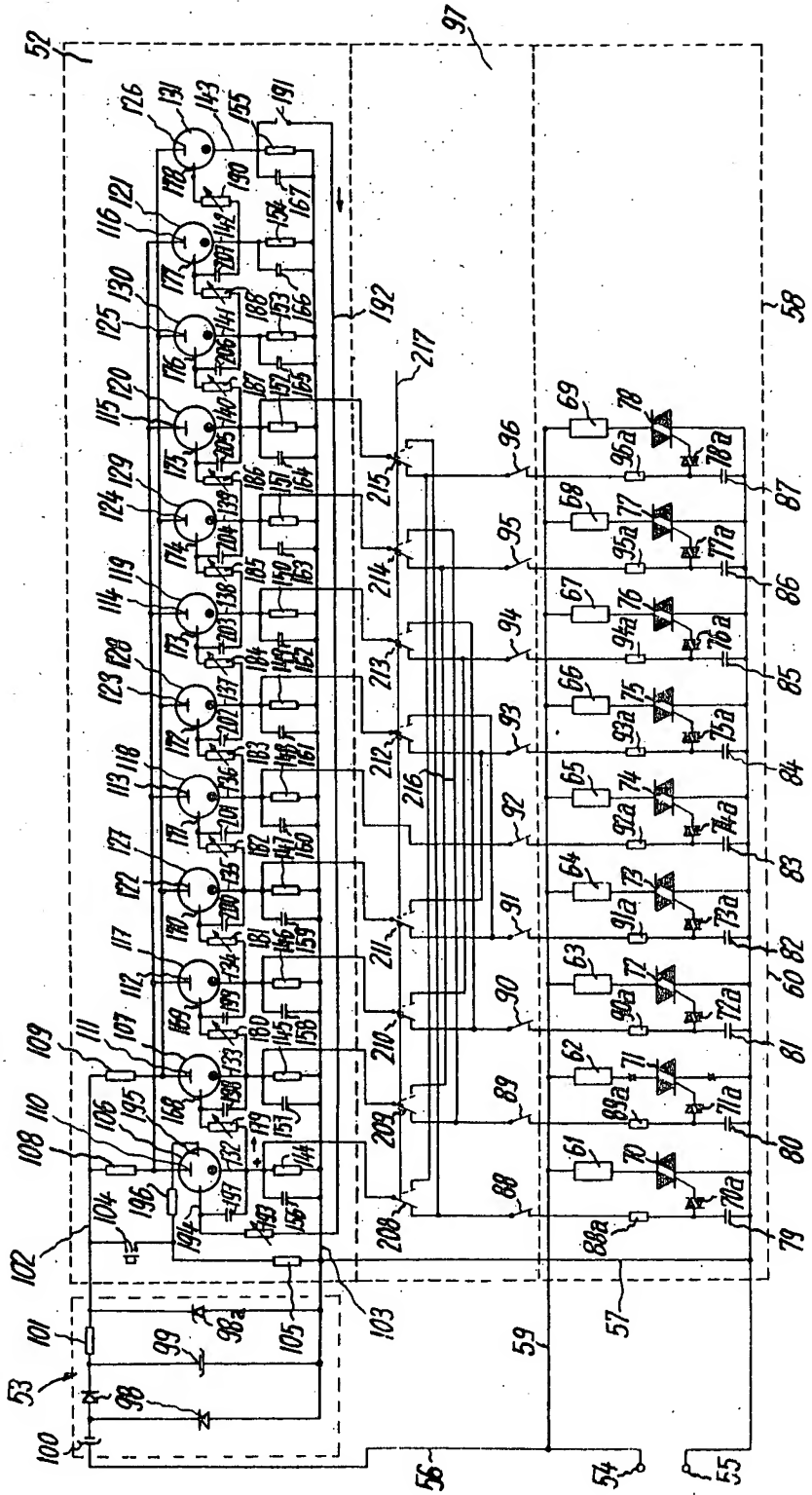
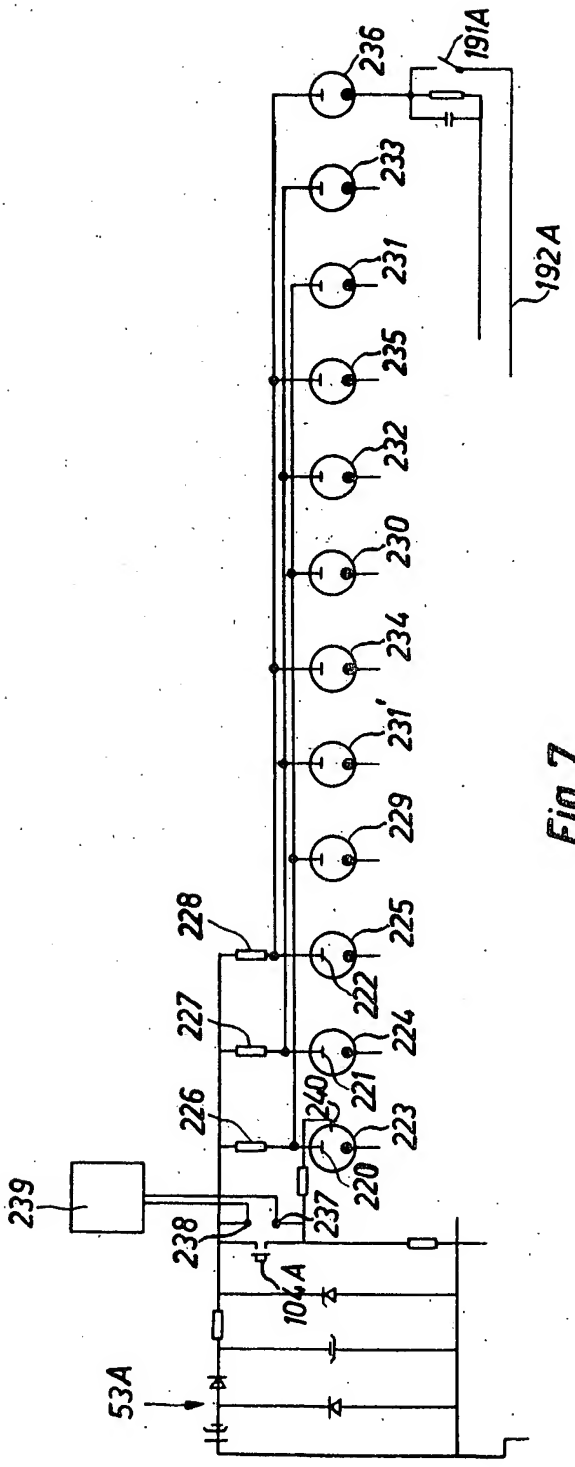


Fig.6


236
191A
233
231
192A
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231'
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228
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104A
53A

Fig. 7